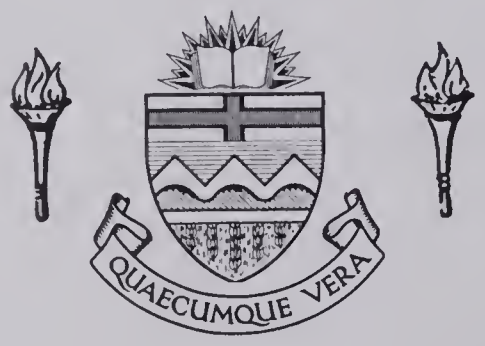


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THE UNIVERSITY OF ALBERTA

# COLOR MEMORY AS A DIMENSION OF PREJUDICE

by

Gary Burn Evans

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

DEPARTMENT OF PSYCHOLOGY

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Color Memory as a Dimension of Prejudice," submitted by Gary Burn Evans in partial fulfilment of the requirements for the degree of Master of Science.

Date: May 27, 68

# ABSTRACT

The lightness, or darkness, of the Munsell 5R series of colors was judged by 60 introductory psychology students. Subjects were equally divided into high and low (F-score) groups. Target colors were used as approximations to 'skin' colors by being observed as backgrounds to three groups of four silhouettes (Negroid, Caucasoid and free-form) cut into white paper. Subjects made their judgments by selecting a grey (Munsell N series) which equalled their memory of the darkness or lightness of the colored stimulus under conditions of contiguous and delayed presentation. All subjects also took the Burnham-Clark Hue-Memory test prior to testing.

Analysis of data shows a small but significant difference between hue-memory scores for the high-F versus low-F subjects. A slight regression, in the lightness matches, was found, and was most evident under delayed judgment. Larger errors of judgment were made also under delayed conditions. Low correlations with hue-memory scores were obtained. Hypotheses relating personality and context to shifts in judgments of lightness (Munsell value) were not supported under the time conditions used. Evidence on the genetic determination of skin color differences is examined, and implications for future research on possible biological bases of prejudice and discrimination are discussed.

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# INTRODUCTION

## The human dimension of skin color

There is a rich source of references and material with respect to cultural stereotypes, attitudes, connotations and associations towards the Negro in contemporary society. For example, Joseph Conrad's 'Heart of Darkness,' Jean Genet's play 'The Blacks,' Henry Miller's 'The White Negro' all refer to the blackness of the Negro, as well as referring to many of the Negro stereotypes in the present culture. Viewing a Negro brings into play stereotyped attitudes, which may lead to associations such as 'ignorant,' 'superstitious,' 'stupid,' 'voodoo, or black magic,' 'darkness,' 'evil,' 'black as sin, or the devil' - all of which are connotations or associations of the English 'black' or 'dark' and may lead to perceiving the Negro as being darker than he really is.

A few empirical tests of these associations have recently appeared (Harbin and Williams, 1966; Williams, 1964, 1966; Williams and Carter, 1967). In these studies, various word-concepts, related in triads, such as black-black man - Negro, white-white man - Caucasian, red-red man - Indian, were randomly and individually rated on a number of semantic differential dimensions. The hypothesized highly related associations within the triads were found, with low relationships between words from different triads. This research has been replicated cross-culturally, and seems to indicate a rather general associative factor between color and racial connotations.

The studies of skin color in the psychological literature are very sparse. The few relevant studies (Caldwell and Mattoon, 1966; Clark and Clark, 1939, 1940, 1950; Harfatia, 1958; Marks, 1943; Parrish,

1946; Seeman, 1946) indicate that dark skin is associated with low status, is undesirable, and may contribute, in the possessor, to feelings of inferiority, unacceptability, et cetera, with respect to the development of the self-concept. Caldwell and Mattoon developed an objectively-colored test, consisting of a colored picture of Sheldon's model body type, plus some colored arms, legs, torsos and heads. From this, the subject picked his own color and a preferred color. Some significant differences in attitudes towards skin colors were found between Negroes and whites, younger versus older Ss, juvenile delinquents versus non-delinquents. This is the only reported study of non-biological stimuli used as 'skin' colors.

Marks (1943) in one of the earliest skin color studies, found that ratings of attractiveness depended on skin color of the target - but were also influenced by the skin color of the judge. Judges tended to consider their own skin color as a reference point in their subjective scale. The most attractive and most preferred skin color was found to be lighter than average, but was not the lightest skin color of the group.

The greatest number of skin color studies have concerned themselves with genetic and biological variables such as inheritance of skin color and measurement of skin color through differential reflectance (Bunsting and Sheard, 1929; Edwards and Duntley, 1939a, 1939b; Gitelson, 1965; Harrison, 1957, 1956; Harrison and Owen (1956, 1964; Harrison et al, 1967; Horton and Crump, 1958; Huizinga, 1965; Kaufman and Sulzberger, 1967; Shaxby and Bonnell, 1928; Sunderland, 1967; Weiner, 1950; Weiner, Sebag-Montefiere, and Peterson, 1964; Weiner, Harrison et al, 1964).

In these studies, reflectance spectrophotometry is often used to measure skin color since it provides an objective measure of color differences on a continuous scale of reflection. Several different populations have been characterized by spectrophotometer measurements, and the contributions of genetic variance to skin color have been somewhat determined. Reflectance measures are now used in problems in population genetics, such as the relative contributions of parental races, differing in skin color, to a hybrid population (Harrison, 1957, 1956; Harrison and Owen, 1956, 1964; Huizinga, 1965; Mazess, 1967; Weiner, Harrison et al, 1964; Weiner, Sebag-Montefiere and Peterson, 1964). Harrison et al (1967) have indicated that the difference in skin color between Europeans and Negroes can be accounted for by approximately four gene pairs.

However, recent evidence seems to indicate that the use of skin color differences as a classification schema for the taxonomic subdivision of man has a limited validity at best (Coon, 1965; Dobzhansky, 1962; Huxley, 1963). The races, as usually classified by physiognomic and skin color differences, have been found to have genetic and anthropological overlap in ways which break down this method of classifying men. For example, Coon (1965), considers the African negro to owe his original genetic make-up to a mixture of European and Bushman. A clear racial distinction between Negroids and Caucasoids may be less distinct than previously believed. Sir Julian Huxley (1963) discusses some of the recent discoveries bearing on genetic selection in man: the intensity and efficacy of selection in nature; realization that the entities which evolve are populations of phenotypes, with consequent emphasis on population genetics on the one hand, and on the interaction between genotype

and environment on the other; and finally recognition that adaptation and biological improvement are universal phenomena in life.

Wasserman (1965) has presented some evidence that evolution of dark skin in Negroes may be an adaptive response to the pressures of tropical disease rather than tropical climate, as has been commonly assumed. Adaptation to disease pressures, by changing activity of the reticuloendothelial system (RES) with related endocrinological and physiological changes, may be considered to be the primary adaptive response. Changes in skin color may be related, yet not adaptive, or they might even be 'accidental' outcomes of selection. Dobzhansky (1962) discusses how 'races' can differ in any adaptive or genetically valuable characters.

The polygenic determination of skin color with consequent likely but unrecognized genotypic and phenotypic variations, and the adaptive pressures exerted by the environment on the genotype, quite probably would contribute to other, less discernible but equally important, differences than skin color between groups of men. Any such genetic differences between the 'races,' other than skin color, could lead to many subtle differences between these groups in characteristics of physiology, psychology, or development. There are many examples of physiological differences between populations that, perhaps coincidentally, differ in skin color: the Quechua Indians of Peru have different oxygen-metabolism rates than American whites (Baker, Buskirk, Kollias and Mazess, 1967); Negroes have different tolerance to heat and cold than either United States whites or Eskimos, and absorb more solar radiation (Adams and Covino, 1958; Baker, 1958, 1967). Developmentally, it has been found that skin color in some Negro women lightens with maturation (Mazess, 1967) so there may be some hormonal relationships to skin color, as

Wasserman (1965) indicated.

It has also been argued that there exist inherited differences in psychological variables such as mental abilities and perceptual skills, between groups of different skin colors (Garrett, 1961; Shuey, 1960). However, the problem of cultural influences enters into all attempts to determine whether there are such racial differences in observed behaviors. Many studies, such as Fulk and Harrell, (1952) have shown differences in measured abilities between Negroes and whites, but very few, if any, have said anything about racial differences in native, inherited potential. On the contrary, most have shown that cultural influences of geography, rural-urban origin and educational disadvantage may account for almost all measured differences (Parsons and Clark, 1966), although it is obviously difficult to disentangle the biological variable of race from such cultural variables. Any answer to the questions of inherited racial differences must await further research.

Skin color related to color perception

Color perception, in general, is one of the oldest problem areas in vision and has a massive literature, as evidenced in two extensive bibliographies by Richter (1952, 1963) which contain well over 6,000 entries even though they cover only the 15-year period from 1940 to 1954. While much of this enormous body of research has been aimed at answering such questions as how people encounter color and make use of this encounter, several well-known theories of color vision and color perception have emerged, as well as general classifications. Perhaps the most significant classification is that of Katz (The World of Color, 1935 in which he describes what are known as "modes of appearance of color." Broadly speaking, color memory is one of the less-well studied modes, but one which would appear to be of some importance to perception in social settings.

One of the most workable color nomenclature systems to evolve from the extensive research on color perception is the Munsell color system (Munsell Book of Color, 1929). This system deals with surface color but has been related to color space describing the illuminance mode (JOSA, 1943). The Munsell system defines the three general surface dimensions "hue," "lightness, or value," and "chroma," under conditions in which the observer is adapted to daylight, that is, conditions specified as average north-sky daylight illumination, or, the illumination provided by a radiating source at approximately 6500° K. These correlates have the further advantage of being approximately linearly related to the magnitude of the corresponding subjective attributes, and thus reflect the psychological facts of object color to a good approximation (Judd,

1951).

Little work has appeared on the perception of lightness,* or neutral color according to Wallach (1963). However, whiteness scales have been devised, relating whiteness of a surface to its reflectance (Woodworth and Schlosberg, 1958). A brightness index relating perceived illumination to surface lightness - known as the albedo measure - has been derived, and processes involved in brightness constancy and color constancy have been studied over a number of years. In this latter regard, Brunswik's constancy ratio (Woodworth and Schlosberg, 1958, p. 436) is an algebraic statement of the empirical facts of brightness matching, that is, a subject matching two differently illuminated greys for brightness will usually compromise between stimulus intensity and reflectance. Wallach's (1963) thorough review of the work on contrast processes in the perception of neutral color has organized most of this information. As well, studies on the brightness of sources and illumination are other aspects of our information on the perception of neutral color.

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*The remainder of this paper will use "lightness" when referring to the Munsell value continuum, since the word "value" will also be used in a motivational-need sense, and might cause some terminological confusion.

Psychological processes underlying responses to skin color

In the most general terms, perception may be considered as response signifying awareness of an environment. Skin color is said to be perceived. But what does this mean? What specific characteristics of the environment and organism lead to this awareness?

The study of perception has been, throughout its history, greatly influenced by three basic approaches. Attempts at explanation of perceptual phenomena have led to the development of sensory (nativistic), empirical, and motivational theories of perception.

The adherents to the doctrine of nativism consider perception to be an immediate, uncontaminated process grounded in physical and physiological laws and present in the individual from birth (Allport, 1955). The phenomenon class which is studied tends to be restricted to such aspects as sensory quality, constancy and configuration. This leads to the classical laws of color perception such as Newton's laws of color mixture, Grassman's three laws, Abney's law of color mixture, et cetera, (Stevens, 1951). The phenomena referred to by these laws are considered as sensory phenomena and can be explained by nativistic activity in tissue systems, initiated by appropriate and adequate stimulation, which is independent of experience and practice (Pratt, 1950).

If, however, the student of perception admits frames of reference, prevailing states, and meanings as part of the perceptual process, there is no denying the large part played, in perception, by past experience. This leads to empirical formulations of perceptual theories attempting to explain such phenomena as depth perception, the various constancies and perceptual illusions (Leibowitz and Heise, 1951). Examples of laws

emerging from empirical considerations would be the Brunswik and Thouless ratios regarding reflectance or brightness matches (Woodworth and Schlosberg, 1958), almost the entire body of classical Gestalt theory and the attempted explanations of perceptual illusions. Helmholtz' Physiological Optics is a classic work in this area. Bartley's (1958) definition of perception as the immediate response of the organism to the energy impinging on the sense organs, influenced by past experience, falls into this category of perceptual theory.

The motivational theorists are not completely separated from the empirical theorists, except in the sense that they consider the prevailing need state of the organism, the 'value' that the object of perception has for the organism - in general, the effects of motivational constraints upon the on-going perceptual process - as part of past experience. They do, however, unequivocally state that perception is not predictable from the physics and physiology of the situation, that is, the impinging energies and consequent nervous system responses (Leibowitz, 1965). This effectively rejects nativism as an approach to adequate perceptual theory. Some of the major theorists falling into the motivational area of perceptual theory are Piaget, Bruner, and Gardner Murphy. This group is also known as Functional, or Directive State, theorists.

These 'New Look' theorists emerged partly in protest to the consideration, within the mainstream of perceptual theory, of the human perceiver as a passive recording instrument of complex design, as well as the related concern with the importance of motivational effects on the perceptual process. They admit the importance of the nativistic considerations of perception, but view this as only a beginning. Bruner and Goodman (1963) quote L. L. Thurstone on this viewpoint: "In these days when we insist so frequently on the interdependence of all aspects of

personality, it would be difficult to maintain that any of these functions, such as perception, is isolated from the rest of the dynamical system that constitutes the person." The problem is one of considering the mutual interactions and effects of the process of perception with other concurrent mental functions. This mutual interdependence has been the concern of the theory and research of the Directive Statists (Krech and Crutchfield, 1948; Levine, Chein and Murphy, 1942; Murphy, 1947; Piaget, 1930). This view has also been expressed more recently by Leibowitz (1965): ". . . we see what we want to see . . . . Stimulation of sense organs does not produce a fixed, mechanical, predictable perceptual response . . . Rather, the final awareness resulting from stimulation is subject to various transformations, alternations, and corrections. During this process the wants, fears, needs and expectations of the observer have ample opportunity to modify and even distort what is finally perceived." There have been many studies in the last twenty years attempting to illustrate the operation of personality-social variables, such as motivation, need and 'value,' in visual processes. The majority of these studies have been concerned with the role of 'value' in vision (Ansbacher, 1937; Bruner and Postman, 1948; Bruner, Postman and Rodrigues, 1951; Carter and Schooler, 1949; Chein, Lane, Murphy, Proshansky, and Schafer, 1951; Dukes and Bevan, 1952; Gilchrist and Nesberg, 1952; Hastorf and Knutson, 1949; Lechelt, 1967; Pepitone, 1950; Tajfel, 1959). Nearly all these studies have defined 'value' as perceived size or numerosity. Very few studies exist which report effects of 'value' on the perception of color. Perceived size is influenced by context, by experience, and by the 'value' ascribed to it by the observer (Leibowitz, 1965).

It seems reasonable to ask if these same experiential variables would influence the perceived lightness of surface colors, which, in this study, were used as approximations to 'skin' colors. The 'value' or 'need' relevance of the perceived object should affect the reported perceptions or judgments of a characteristic of that object, that is, the lightness of the color.

The authoritarian personality as a color perceiver

Research on authoritarian and prejudiced personalities was given its major impetus by the work of Adorno, et al (1950). Later research indicated that authoritarian or ethnocentric individuals may employ different judgmental processes than non-authoritarians (Crockett and Meidinger, 1956; Rabinovitz, 1956; Scodel and Freedman, 1956; Scodel and Mussen, 1953). Berkowitz (1959, 1960) indicated that, under stress, high prejudiced persons tend to make grosser discriminations among stimuli than do low prejudiced persons, though an attempted extension (Berkowitz, 1961) gave conflicting, equivocal results. In an effort to resolve this conflict, Rule (1966) and Fischer and Rule (1967) reported that highs and lows tended to make similar judgments, while moderates differed from the extremists. This apparent refutation of Berkowitz work was resolved in noting that, due to a smaller sample, Berkowitz' lows actually corresponded to Rule's moderates.

There is essential agreement between the above research, and a parallel line of research on dogmatism, initiated by Rokeach (1960), which suggests that extremists differ from moderates in conceptual systems (Burke, 1967; Plant et al, 1965). The above evidence indicates that authoritarian, prejudiced or dogmatic extremists exhibit different judgmental behaviors than do moderates, especially when under stress. Loisalle and Williamson (1966) reported that seeing pictures of Negroes was stressful to their subjects, evidenced by raised GSR's and perceptual defense thresholds. High authoritarians should not differ, in their sensitivity to the color dimension of lightness, from low authoritarians, simply on the basis of a difference in their F-scale scores. However, a Negro context should activate any distortion in lightness memory by raising the

emotional value of the stimulus with respect to the need state of authoritarianism.

The Bruner, Postman and Rodrigues (1951) study is probably the only report of memory shifts in induced color due to the context in which the perceptual act occured. They analyze perceiving as a three-step process: 1) The organism gets set, or 'tuned,' toward some class of stimulation, or events in the environment - thus O is said to have an "initial hypothesis." 2) Input of stimulus information - dealing with cue characteristics of the stimulus rather than energy characteristics. 3) Hypothesis is confirmed or infirmed.

In their study, the Ss were given an initial hypothesis: The experimenter said that a poorly-saturated patch of induced orange color was a 'tomato.' This hypothesis was readily confirmed by shape cues, and not completely disconfirmed by the poor color information. Evidence that the initial hypothesis, or context, played a large part in final color matches was indicated by the tendency of Ss to make a redder match to 'tomato' than to objects not normally red (banana) but of the same induced color. By the same reasoning, giving Ss the initial hypothesis of 'seeing a Negro' is easily confirmed by the shape of the stimulus patch, and is not completely disconfirmed by the 'skin' color of that patch. Thus, the final match of the lightness of the Negro silhouettes should be influenced by the initial hypothesis, that is, judgments, at the lighter colors, will be 'too dark,' since the remembered, or usual, appearance of the Negro is 'black.' The Bruner, et al, study is strong evidence that context can be used to effect a shift in the perception (or reported perception) of a given characteristic of interest, in their case, hue.

In sum, the 'New Look' in perceptual theory has stimulated controversy concerning the effects that personality or motivational variables and context or experience, have on perception (Bruner, 1951; Hays 1961; Luchins, 1950, 1951; Pasacre, 1949, Postman, 1951). There have been a number of studies on memory for hue, generally concerned with the influences of familiarity or experience of the colored object on color-memory (Adam, 1923; Bartleson, 1960; Burnham and Clark, 1955; Hamwi and Landis, 1955). The influence that color names, or labels, have on the recognition and memory of colors is an area of common concern (Bernbach, 1967; Bruner, Postman and Rodrigues, 1951; Chapanis, 1965; Lenneberg, 1961). However, the relations that personality, motivation and context bear to lightness memory is unknown. More specifically, there are no studies indicating how parameters such as context might affect lightness memory, in the way that Bruner, Postman and Rodrigues (1951) showed memory for hues to be affected by context.

Problem

On the basis of 'New Look' theory, the work of Adorno, et al (1950) and subsequent research it was hypothesized that high-Authoritarian individuals would perceive and judge skin-colors of out-group members differently than would persons with lower F-scale scores. It was not possible to use samples of various skin colors as stimuli, for various reasons. An approximation was therefore made with the Munsell 5R series as the stimuli to be judged. The ingroup-outgroup judgmental situations were determined by the context, that is, cut-outs which suggested Negro or Caucasian stimuli were placed over the colors. The task was to judge the degree of lightness of the 'skin' color in its particular context. A

set of free forms, equated for area, was used as a control context.

The hypotheses tested were the following:

1) Subjects will be able to accurately equate lightness of colors with lightness of greys (neutral colors).

2) A reliable relationship (correlation) exists between hue memory and lightness memory, since they are treated in theory as related aspects of color perception.

3) Negro surrogates will be perceived as 'darker' than Caucasian surrogates, by all subjects.

4) High-authoritarian individuals will perceive Negroid stimuli as 'darker' than will low-authoritarian individuals, and Caucasoid stimuli as 'lighter.'

5) Memory (delayed versus immediate matching) should accentuate the effects postulated in 3 and 4.

## METHOD

### Subjects

The entire introductory psychology class, (738 students), completed the 28-item F scale (Adorno et al, 1950). Item scores varied from 5 points for a response indicating strong agreement with an item to 1 for a response indicating strong disagreement. The resulting distribution of the scores on the F scale was; range, 28 to 114; median 76. Subjects were selected from this pool on the basis of F scale scores as follows: thirty subjects who scored over 80 and thirty subjects who scored between 49 and 69. The resulting sample consisted of 34 men and 26 women. This method of subject selection was employed to obtain a group of high scorers on the F scale, and a group of low scorers, with no overlap between the two groups. Evidence indicates that these two groups would differ in judgmental, and perhaps even in perceptual responses (Adorno, et al, 1950; Berkowitz, 1959, 1960, 1961; Rule, 1966). The scores on the obtained groups were as follows: High group, range, 80 - 104, mean, 87.8; Low group, range, 49 - 68, mean. 60.0. When compared to the total distribution of scores, the groups appeared to be a group of highs, without the very extreme scorers (only 17 of 738 scored over 100) and a group of lows, but also without the very extremes (only 14 of 738 scored below 49).

### Apparatus

Two sets of apparatus were located in adjacent rooms. The first room contained the color memory apparatus and the second room the lightness matching apparatus.

The hue memory room lighting was provided by a combination of fluorescent and incandescent bulbs, giving a good approximation to daylight. This information was provided by a consultant from a local optical

firm. The test of hue memory was made using an adaptation of the Burnham-Clark Munsell test apparatus (a test of hue memory), obtained from the Munsell Color Company, Baltimore, Md. This test instrument consists of a bearing-mounted wheel on which are glued the test chips and comparison chips in two concentric circles (Burnham and Clark, 1955). The comparison chips, in the outer circle, consist of the 43 hues of the Farnsworth-Munsell hue series, (Farnsworth, 1943). The hues are approximately equally spaced visually, and had nearly equal chroma and value (saturation and lightness, respectively, in the Munsell system).

Twenty of these chips are duplicated in the inner circle as test chips, plus two duplicates used for practice trials. The chips are arranged in spectral order to create a closed circular hue dimension, represented by small, visually uniform hue steps. The circular arrangement eliminated end points which might have acted as judgement anchors.

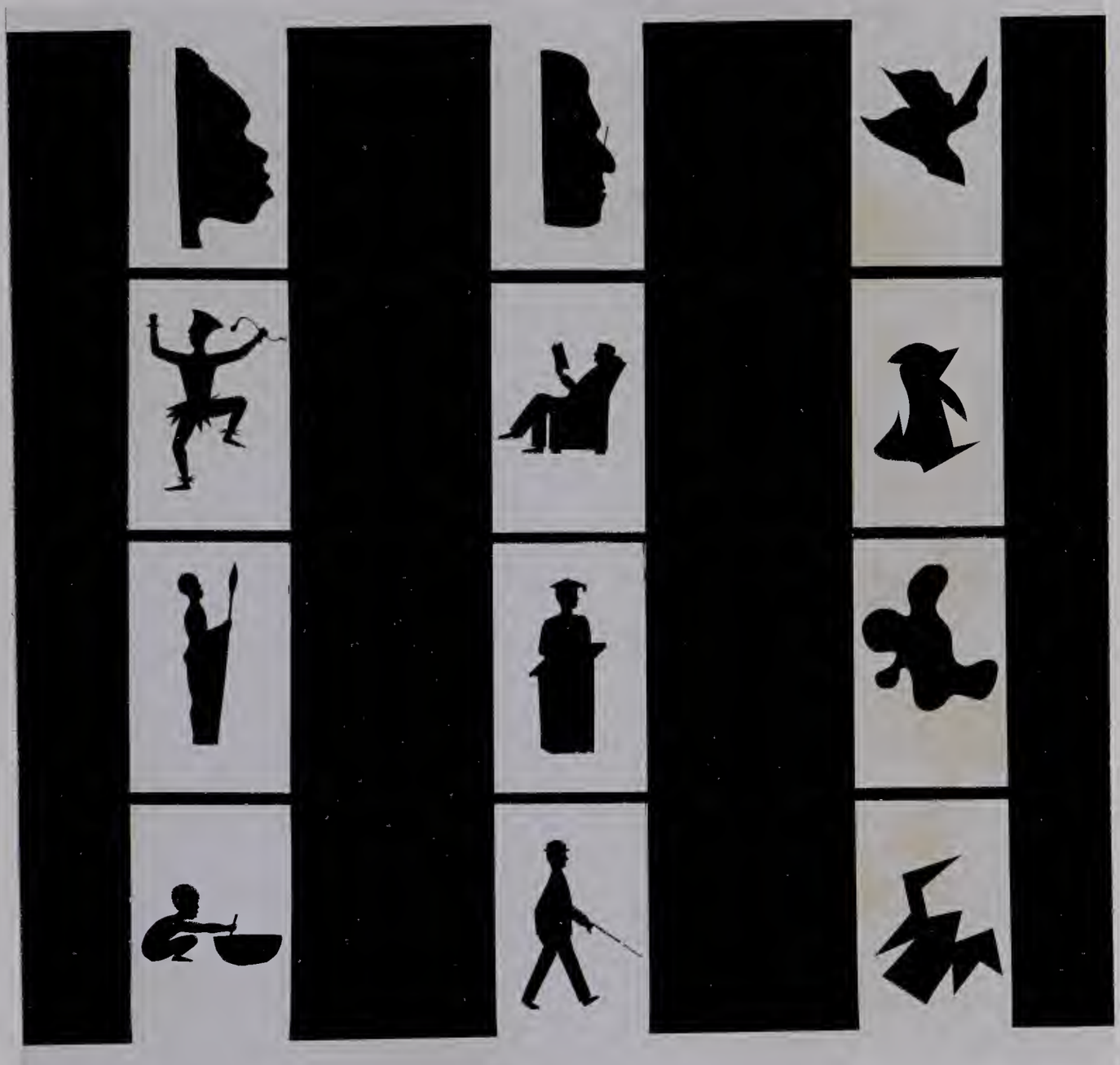
Test and practice chips are mounted so as to correspond radially to the comparison chips that they duplicated. A simple set of code numbers (the 1, 3, 5, 7, 9, et cetera, used to designate the Farnsworth-Munsell series) located directly opposite the pair of chips identify the comparison and test chips. The code numbers are viewed by the tester through an aperture in the covering surface. The same random order of presentation, as listed on the scoring sheets accompanying the test, was used for each S.

Two apertures are near the edge of the cover, at the testee's viewing position. These are located so that either a test chip or comparison chip can be exposed to the testee, without shadows. The aperture to be opened is controlled by the experimenter via a lever-operated shutter.

The second, or lightness matching room, was a light-proof room, 7' x 12' x 8', with an exhaust fan providing ventilation and a slight masking noise to lessen distractions. The walls and ceiling of the room were painted a flat, dark grey (about Munsell 4N).

Illumination for the lightness matching was provided by a Macbeth Type TC 440 Examolite. This gives a good approximation to average daylight, or to another often specified source - one radiating at 6500° K. The fixture was centered over S's median plane and was mounted at a 45° angle from horizontal with the front edge 6 1/2 feet from the floor and 3 feet (horizontally) from the subjects forehead. Illumination at the stimuli was approximately 8.9 foot - candles.

The lightness-matching apparatus presented stimuli on the frontal plane of S at eye level but 12" to the left of the median plane. One section was comprised of two 40-inch diameter, 5/8-inch plywood wheels mounted on a common horizontal axle. These discs could be rotated independently. Wheel 1, 5 feet from S, had four 6 inch by 10 inch rectangular apertures, 90° apart, near the rim. The silhouettes shown in Figure 1 were mounted over these cutouts. The silhouettes, cut from white artist's paper, were mounted in white cardboard, attached to the wheel, and held in place with masking tape. Colors placed behind these silhouettes provided the surfaces which were to be matched in lightness by S. These were carried on wheel 2. Stimulus surfaces of wheel 2 were seven 8 1/2 inch x 11 inch sheets of the series of Munsell 5R papers. Colors used were 5R3/2, 5R4/2, 5R5/2 . . . 5R9/2. The two wheels were constructed so that, when a desired color - silhouette combination was reached, a friction lock was made, and the two wheels were held about 1/4 inch apart.



(a) (b) (c)

Figure 1 Silhouettes used to determine context of lightness judgments. (a) Negroid
(b) Caucasoid
(c) free forms

Wheel 3 was the response wheel. This was also mounted in S's frontal plane, but centered 12 inches to the right of S's median plane. Seventeen Munsell greys (1.5N, 2.0N, 2.5N . . . 9.5N) were mounted at the rim on seventeen equally spaced radii. S rotated this wheel by turning an undifferentiated knob on the axle attached to the wheel holding the grey papers.

Subjects viewed both the color-silhouette combinations and greys through a septal, black-painted (about Munsell 2N) tunnel. Reduction screens were positioned at the end of the tunnel, with pulley-operated shutters over the apertures to control viewing time. All subjects viewed the color-silhouette combinations with the left eye, and the greys from which the response was chosen, with the right eye. A white, matte cardboard (about Munsell 9N) with a rectangular cut-out, was positioned between the right aperture and the greys. This equalized both the areas of color and grey viewed by S and the amount of white surround.

Procedure

Subjects were randomly assigned to the context groups under which they would perform judgments of lightness. Thus, of the thirty high F-scale scorers, 10 performed under the Negroid, or African context, that is, the conditions in which the colors judged were the backgrounds of the African silhouettes (see Figure 1a), 10 performed under the Caucasoid, or Canadian (Figure 1b) and 10 performed under the free-forms (Figure 1c). The same random assignment was employed for the low F-scale subjects.

A hue-memory score was obtained prior to testing for lightness judgments. Subjects were seated across from E, who engaged them in conversation for one minute to relax them. The instructions and demonstrations

were then given to the S, as written in Burnham and Clark (1955, p. 166-167):

> "This is a test to find out how well you remember colors . . . . . find the color as quickly and accurately as possible."

Average time for testing was approximately fifteen minutes.

The test was scored by recording the absolute arithmetic difference between the numbers of the chip selected by S and the number of the chip presented by E. Practice chips were not scored. The hue-memory score was obtained by adding these differences and dividing by two. Thus, a score of 20, obtained over the 20 judgments, would mean that S selected chips, on the average, which were one chip (about 2.2 Munsell hue steps) removed from the presented chip. After testing was completed, all subjects were told, "You did quite well," to encourage their cooperation in the second stage, and not raise their anxiety level by furthur comment.

S was then ushered into the second room for the lightness testing. S was seated comfortably in front of the septal tunnel, with his chin resting on the tunnel base so that the septum was about 1/4 inch away from his nose. None of the Ss reported any unilateral visual difficulties. The S was shown, by E, the knob which turned the response wheel, and was told that a demonstration and some instructions would take place. The experimenter then walked behind the apparatus so as to be able to change stimulus combinations, operate the shutters, record responses, et cetera. The following instructions were then read to S:

"I am going to show your left eye a series of cut-out figures. These cut-cuts are silhouettes of:

1. African males engaged in primitive activities.

2. Canadian males engaged in everyday activities.

3. Some abstract shapes.

Each of these cut-outs will have a color behind it, which represents a skin color. I want you to perceive the lightness or darkness of these skin colors. Then, by turning the knob with your right hand, match your perception of lightness or darkness with one of the shades of grey which you will see with your right eye. In other words, pick the grey which looks equally as light or dark - and your choice is from black to white - as the color does. I'll give you a brief demonstration. I'll first show you a picture like this (E then exposed one of the stimuli by raising the shutter over the left aperture) and you will match it over here (E raised the right shutter, and then spun the wheel holding the greys) with one of these greys - say, this one. (E picked a grey obviously too light or dark - but told S this was just an example which was not necessarily correct). When you have selected the one you are satisfied with, say 'OK,' and I'll drop both the shutters, and record your choice. Then we'll go on to the next one.

Now I'll show you each of the cut-outs that you are going to see (the appropriate comments, from the following, were then read).

A. This is an African
(1) profile
(2) warrior
(3) dancing
(4) cooking

B. This is a Canadian
(1) profile
(2) reading
(3) walking
(4) lecturing

C. This is a (n)
(1) rounded shape
(2) angular shape
(3) partly rounded, partly angular shape
(4) another partly rounded, partly angular shape.

"As we go through these, the color behind a given picture will change, so don't bother trying to remember what you did with a certain picture last time, since it won't be the same. (One of the following comments was then read, where appropriate). (1) You will notice that there are no eyes or other identifying features, and also irrelevant objects like (a) the spear and the pot are also colored. (b) the hat, cane and podium are also colored. (2) (Nothing of the above nature was mentioned about the free forms).

"I hope that you can overlook these details and (a) see each person, or (b) see each shape as being one skin color or another.

"Now, one-half of the time, I will show you just the cut-out on the left for 5 seconds, and then I'll drop the shutter, like this, (demonstration). You will have to wait about 10 seconds before you make your match. After the 10 seconds, I will raise the right shutter, like this, (demonstration) and you can then make your match. Try to perform the matchings as quickly as possible, just like you did on the color test you just finished, since this will again let you do a better job. Don't worry about being right or wrong - only a machine is perfect - I just want you to 'call them as you see them.' Try to ignore the slight shadows around the edges, and make your matches to the well-lit center portion of the figure. Remember, work as quickly as you can, and still be accurate.

"Do you have any questions about what you are to do?" (Pause - if questioned, E repeated the appropriate portion of the instructions.) "Ready now?" (pause) "Here's the first one."

The experimenter then began presenting stimuli to S, and recording his responses. Trials were randomized, prior to testing, as to whether they would be immediate or delayed matches. This was done in such a way

that, at the end of 28 trials, 14 were delayed, and 14 were immediate, matches. On the second run-through, the same 28 color-cut-out combinations were repeated, in a different random order, but the conditions of response were reversed so that a combination viewed for a delayed match the first time was now viewed for an immediate match. Thus, each possible color-silhouette combination was judged under both conditions by each S.

The dimensions of the area exposed, at the wheels, by each reduction screen aperture, were about 6 inches x 8 inches. The field consisted of approximately 10 - 12 square inches of colored field (either 5R series or greys) with the remainder a surround of white matte artist's paper. Subjects took from 4 seconds to 15 seconds to make their judgments. Average time of testing at this phase was 45 minutes. All but one subject, whose data was discarded, finished in the 45 minutes allowed. Two subjects' data were discarded as being too atypical to assume they understood the task. Both these subjects showed a great restriction of response range; one made all her responses with either 9.0N or 9.5N, while the other used only 1.5N and 2.0N.

Results

Data were averaged for each subject to give an average lightness (Munsell value) response, over the four pictures of a series, to a given color for each of the immediate and delayed conditions. The data for each subject was then in the form of 14 average lightness judgments (two average lightness responses for each of the seven 5R colors of differing Munsell value). These data were subsequently analysed by a repeated-measurements analysis of variance design, with a summary of the outcomes as noted in Table 1. Sample raw data sheets and averaged data sheets are

Table 1

Summary of Analysis of Variance for the Effect of Authoritarianism and Context on Lightness Judgments

| Source | d.f. | Mean Squares | F |
|---|---|---|---|
| A | 1 | 14.9 | 1.94† |
| B | 2 | 5.9 | ns |
| AxB | 2 | 5.1 | ns |
| S(AxB) (error) | 54 | 7.7 | |
| C | 6 | 438.4 | 975.00* |
| AxC | 6 | 0.5 | ns |
| BxC | 12 | 1.1 | ns |
| AxBxC | 12 | 0.1 | ns |
| S(AxB)xC | 324 | 0.5 | |
| D | 1 | 0.08 | ns |
| AxD | 1 | 0.07 | ns |
| BxD | 2 | 0.30 | ns |
| AxBxD | 2 | 0.07 | ns |
| S(AxB)xD | 54 | 0.24 | |
| CxD | 6 | 2.73 | 21.50* |
| AxCxD | 6 | 0.22 | ns |
| BxCxD | 12 | 0.31 | 2.39* |
| AxBxCxD | 12 | 0.11 | ns |
| S(AxB)xCxD | 324 | 0.13 | |

A = authoritarianism
B = context ( picture series)
C = stimulus (5R) series
D = temporal condition ( delay vs. immediate)

†$p < .10$
*$p < .01$

shown in Appendices 1a and 1b. The analysis was performed on IBM 7040, with a NYBVAR program from the University of Buffalo.

It is apparent from Table 1 that the effect of personality (authoritarianism) did not reach accepted standards of significance, although the difference is in the expected direction. As well, neither the context (pictures) nor the interaction between context and personality had any apparent effect on the judgments of Munsell value. These results effectively controvert hypotheses 3 and 4, as well as hypothesis 5, since it depended on 3 and 4 being significant.

The highly significant C main effect (the lightness judgments as dependent on the 5R stimulus series) gives stronger support for hypothesis 1 than was expected. One way of phrasing this result is that the variance within the judgments about a given stimulus was low, while the variance between judgment means was high. Thus, accurate and stable group judgments of the lightness of colors were obtained, when the results were averaged over both immediate and memory matching conditions.

Figure 2 shows graphically the significant CxD (stimulus series X temporal condition) interaction. This interaction simply shows that the direction of the differences between immediate and memory matches reversed, near the mid-point of the stimulus scale. Tests of the significance of the differences between the judgment means, under the two temporal conditions, for any one of the stimulus colors, were all non-significant. Thus, a picture emerged of stable and accurate judgments of lightness at each level of the 5R stimulus series, regardless of attempts to interfere with, or distort, those judgments by suggestion of ethnic context. The only distortion apparent was a slight regression effect. The differences between obtained and expected judgments probably indicates a

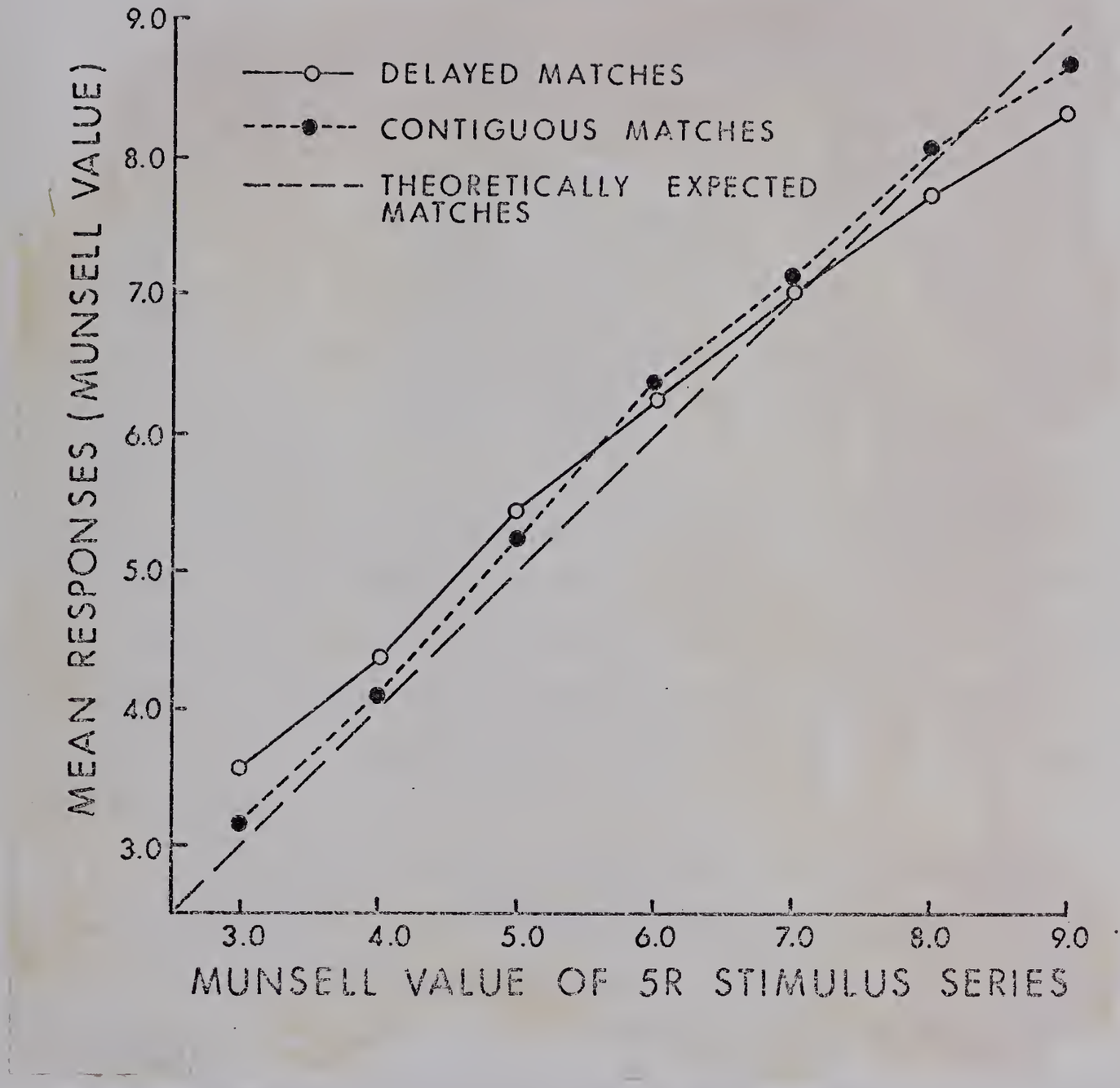



Figure 2 Mean lightness judgments of sixty subjects under contiguous and delayed matching conditions.

slight regression towards the mean of a judgment scale. Stevens and Greenbaum (1966) have shown this regression effect in a variety of psychophysical judgment situations. Hollingworth (1910) mentioned this "central tendency of judgment" where the observer tends to regress toward a central value and thereby shorten his range of adjustment. He said, "Judgments of time, weight, force, brightness . . . have all shown the same tendency to gravitate toward a mean magnitude . . ." Figure 2 illustrates that the delayed matches show a slightly greater regression when memory for the stimulus is involved, that is, the direction of the differences reversed.

It can be seen from Figure 2 that there appear to be greater absolute errors of judgment, at most stimulus levels, under the delayed condition than under the immediate condition. A simple, two-tailed sign test (Seigel, 1956) of this hypothesis gave the following result; A larger error of judgment occured significantly more often under delayed conditions ($p < .005$).

The same type, or form, of graphs was obtained for the BxCxD (context X stimulus series X temporal condition) interaction, that is, the CxD interaction over the three levels of B. The relevant judgment means are reported in Table 2. The crossovers occured at slightly different points for each of the graphs, which accounts for the statistically significant, but meaningfully slight, interaction. No significant differences between any of the mean judgments were found at any stimulus level (Duncan's new multiple range test, Edwards, 1962). This means that, in considering the various average judgments of stimulus 5R3/2, there were no significant differences among these means. Thus, it was not possible to say, for example, that Negroids were judged darker than

Table 2

Judgment means for BxCxD interaction

| Munsell value of stimulus color | B 1 Negroid | | B 2 Caucasoid | | B 3 free form | |
|---|---|---|---|---|---|---|
| | D 1 | D 2 | D 1 | D 2 | D 1 | D 2 |
| 3 | 3.04 | 3.68 | 2.80 | 3.19 | 3.60 | 3.72 |
| 4 | 4.03 | 4.27 | 3.88 | 4.05 | 4.29 | 4.73 |
| 5 | 5.17 | 5.17 | 4.98 | 5.43 | 5.49 | 5.63 |
| 6 | 6.33 | 6.12 | 6.33 | 6.25 | 6.44 | 6.51 |
| 7 | 7.04 | 6.83 | 7.17 | 7.10 | 7.16 | 7.08 |
| 8 | 7.93 | 7.44 | 8.12 | 7.98 | 8.16 | 7.73 |
| 9 | 8.63 | 8.15 | 8.76 | 8.53 | 8.75 | 8.35 |

D 1 = contiguous match
D 2 = delayed match

Caucasians. These results would appear to simply demonstrate the statistical significance which emerges from the obvious crossovers, in all three cases, and not relate to any relevant affect-laden significance which caused a distortion of the perception. However, in employing the sign test with respect to the apparently greater errors of judgment under delayed conditions, the following results were obtained; a larger error of judgment occured significantly more often under delayed conditions for:

1) all judgments of the Negro surrogates ($p < .01$)

2) all judgments of the free forms ($p < .02$)

3) judgments of Negro surrogates, by high-authoritarians ($p < .02$)

Most interesting was that any other groups, including the over-all judgments of the Caucasian surrogates, had non-significant differences in the number of greater errors under memory. In summary, delaying the judgments tends to increase error, except when the lightness being judged is that of a Caucasian silhouette.

The hue memory scores provide one unusual result. The difference (2.0 units, or about 4.4 Munsell steps) between the mean hue memory scores of the high versus the low authoritarian groups (18.7 and 20.7, respectively) is small but statistically significant ($t = 2.73$, 59df., $p < .005$). The F-ratio of the variances of the two groups was non-significant, so a t-test seemed appropriate. The performance of the total group, with a mean of 19.3 and a median of 19, was not discrepant from reported norms. Table 3 shows the obtained correlations between authoritarianism and hue memory, for the various groupings of subjects. It can be seen that there is no evidence in the correlations to support any strong relationship between the personality variable of authoritarianism and hue memory performance.

Table 3

Correlations between authoritarianism and hue-memory

| Group | Correlation |
|---|---|
| Total (N=60) | -.16 |
| Hi F-score (N=30) | .03 |
| Lo F-score (N=30) | .12 |
| Negroid Context (N=20) | .02 |
| Caucasoid Context (N=20) | -.11 |
| Free form Context (N=20) | -.30 |

Correlations were also obtained, between the lightness (value) judgment scores for each stimulus and F-scores and hue memory scores. The medians of the 14 obtained correlations for each subject, for both hue memory and authoritarianism, are reported in Table 4 as being roughly representative of the obtained results. None of the median correlations are significantly different from zero nor are any of the correlations within a subgroup significantly different from one another. The entire matrix of intercorrelations is presented in Appendix 2. Some evidence for a real difference between the high and low F-scale groups might be indicated by the difference between their correlations with lightness memory (-.21 versus .23). Though this difference is not quite significant, it is rather large. This difference, when considered with the significant difference in hue-memory scores, as well as the near-significant A main effect, gives a hint that the personality difference influences something in the judgments, but that this study was not sensitive enough to discover the effect.

Table 4

Median correlations of lightness-memory scores with authoritarianism and hue-memory

| Group | Correlation with authoritarianism | Correlation with hue-memory |
|---|---|---|
| Total | -.22 | .03 |
| Hi F-score | -.13 | .21 |
| Lo F-score | -.19 | -.23 |
| Negroid context | -.41 | .16 |
| Caucasoid context | -.06 | -.08 |
| Free form context | -.08 | -.10 |

## DISCUSSION

A brief restatement of the five hypotheses tested is presented here to clarify the following discussion:

1) Hue-memory and lightness memory performances should be related.

2) Subjects should be able to match lightness of colors and greys with reasonable accuracy.

3) Negroes will be seen as 'darker' than Caucasians.

4) Personality (F-score) differences should accentuate the effect postulated in hypothesis 3.

5) Matches made to memory traces will furthur accentuate the differences in lightness judgments.

The results most convincingly illustrate that the last three hypotheses, relating 'value' to perception, were not supported under the conditions used. Thus, little can be said - perhaps because of the methodological weaknesses, or because of the nature of the phenomena studied - other than echoing the finding of Chapanis (1965) that judgment and/or memory of the lightness (black-grey-white) continuum shows remarkable consistency, accuracy and reliability, is affected very little by extraneous stimuli or memory distortions, and has little relationship to, or dependency on, the individual's perception of, or memory for, hue.

If the obtained results indicate the true state of affairs regarding lightness perception, how might we explain the lack of influence of the postulated 'value' effects on such perception.

Firstly, let us again make the distinction between sensation, perception and judgment. Sensation, which is considered to be tissue process, is of concern to physiologists, neurologists, et cetera, but

has nothing, in itself, to do with overt behavioral responses, except as the initiating process in the perceptual response.

Classical perceptual theory held the view that the basic data of perception were 'sense data,' that is, the introspectionistic report of the primary 'givens' of sensation, such as 'patch of red,' 'grey flash,' 'circular form,' and so forth. These 'sense data' were seen as the unalterable bases of perceptual responses; they are sensations that are immediately presented to awareness without interpretation or any mediating transformations. This viewpoint was carried to the extreme among the writings of the philosophers of science who expounded the postulates of positivism and, more recently, logical positivism. This position has come under strong attack recently from both philosophers and psychologists, and, as a consequence, the concept of 'sense data' has been effectively done away with in current perceptual theory. (Sarbin and Bailey, 1966; Brody and Oppenheim, 1966).

The basic perceptual response thus becomes a response with the minimum of mediating transformations and interpretations. We must allow these transformations, as being the past experience of the organism which influences the response, or we return to the 'sense data' position. A definition of a perceptual response is thus offered; A similarity/difference response (judgment) made to contiguously present stimuli - the effect of past experience being allowed in what constitutes a similarity/difference judgment for the subject, and 'continguously present' defining what is meant by 'immediate' in other definitions of perception such as Bartley's (1958).

This was the task placed before the subjects in the immediate matching of lightness, and would therefore be influenced by past

experience only, say, in the learning of what similar-different means. We would not expect such perception to be influenced by the context (in this procedure) or by the 'needs' and 'values' (prejudices) of the individual. However, it was expected that under delayed-matching conditions, a distortion in judgments would be evidenced. This apparently did not occur. One 'explanation' or 'excuse' which may be offered for this lack of support for the hypotheses is that the time-delay was too short to allow distortions to have occured. That is, the 10-second delay was probably within the limits of short-term memory, (Bernbach, 1967) and memory traces retreived from STM are known to be resistant to distortion or loss. If, on the other hand, longer delays would still show no distortion, we might offer a more speculative interpretation. We might, for example, consider brightness or lightness discrimination to occur at lower levels of the brain than the cerebral cortex in the intact organism. Certainly brightness discrimination is an evolutionarily old response, and one having major adaptive significance for the species. The possibility of evolutionary considerations in the development of theory about human brain function has recently been discussed by Natapoff (1967). It may thus be that lightness memory will simply not be distorted, as our invocation of directive state theory might suggest, because of the survival value of such resistance.

There also exists the possibility that the methodology employed here was just not sensitive enough to discover any effects of 'value' on lightness judgments. Two major criticisms may be made regarding the obtained selection and use of subjects on the basis of their F-scale scores. First, evidence suggests that extreme scorers at either end of the scale display similar perceptual and judgmental behaviors, and that

the predicted differences are obtained only when a tripartite selection of subjects is employed (Rokeach, 1960; Rule, 1966). The attempt was made, therefore, to obtain a group with high scorers (extremes) and a group of medium-low scorers (middle), with a definite division between them. However, examination of the obtained scores shows both groups to be quite extreme, and this in itself may account for their similar perceptual behavior. Second, even if a perceptual difference would obtain between two such samples, some studies indicate that emotional arousal is necessary to bring out the difference (Berkowitz, 1965; Fischer and Rule, 1967; Rule, 1966), and that a study such as this which did not directly employ arousal would not initiate the differential processes of dealing with the emotion. Also, a more directly relevant selection criterion, such as degree of anti-Negro prejudice, might have been used. However, the Authoritarian personality is conceived as the broadest and most general of the prejudiced personalities (Adorno, et al, 1950), and this is primarily the reason it was used. No attempt was made to make the stimuli particularly or potently relevant, although Loiselle and Williamson have indicated that simply viewing a picture of a Negro may be emotionally arousing for subjects.

The evidence offered by the significant BxCxD interaction, the difference in the hue-memory scores, the near-significant A main effect and the evidence of the various correlations gives a marginal hint, but nonetheless a rather compelling one, that there were some 'value' influences on the perceptual behavior; the design of the study and the flaws noted above, simply did not allow these effects to be evidenced in the data. The evidence for the associations between racial concepts and colors offered by Williams and his co-workers (Harbin and Williams, 1966;

Williams, 1964, 1966; Williams and Carter, 1967), adds to the suggestion that these additional variables need furthur study before a definite conclusion can be arrived at regarding any relationship between lightness judgment and 'value.'

Consideration might be given to an additional possibility. It would appear from the results that differences only in skin color do not result in distorted perceptions due to authoritarianism, though the theoretical statement in the introduction of this thesis led to the opposite expectation. This indicates that skin color alone may not invoke prejudiced behaviors, which is the same point made by the majority of studies on prejudice; cultural variables associated with being a Negro determine to a great degree the expression of prejudiced behavior. Prejudice itself is one of these cultural variables. In spite of this large body of evidence, Ingle (1967) feels that there is evidence, weak though plausible, that there are biological as well as environmental bases for racial differences in school, job and cultural achievement. Garrett (1961) believes that the efforts to show there are no differences, which he calls the 'Equalitarian Dogma,' represent a sincere but misguided effort to help the Negro by ignoring or suppressing evidence of biological differences. Additional research is obviously needed in this area which is shrouded with emotional arguments. Psychology may benefit by exploring the possibilities for intra- and inter-racial, genetically-based, differences between people, an area at present nearly ignored by social scientists, and only poorly started by biologists. However, much better tests of the initial hypotheses of this study are necessary - better subject selection, and greater time-delays, for example - before any of these more speculative possibilities can be better entertained. Also, a less objective

judgment situation, that involved more 'real' stimuli than the colored silhouettes, would need to be considered before these findings could be theoretically extended.

In conclusion, the most obvious finding of this study is the high degree of accuracy and stability of the lightness judgments. Slight evidence of motivational influences on perception were obtained, but were inconclusive.

REFERENCES


Adam, G. K. An experimental study of memory, color and related phenomena. Amer. J. Psychol., 1923, 34, 359-407.

Adams, T and Covino, B. G. Racial variations to a standardized cold stress. J. Appl. Physiol., 1958, 12, 9-12.

Adorno, T. W., Frenkel-Brunswik, Else, Levinson, D. J., and Sanford, R.N. The Authoritarian Personality. New York: John Wiley and Sons, 1964.

Allport, F. H. Theories of Perception and the Concept of Structure. New York: Wiley, 1955.

Ansbacher, H. Perception of number as affected by the monetary value of the object. Archives of Psychology, 1937, No. 215.

Baker, P. T. Racial differences in heat tolerance. Am. J. Phys. Anthrop., 1958, 16, 287-305.

Baker, P. T. Human biological variation as an adaptive response to the environment. Eugen. Quart., 1966, 13 (2), 81-91.

Baker, P. T., Buskirk, E. R., Kollias, J. and Mazess, R. B. Temperature regulation at high altitude: Quechua Indians and U.S. whites during total body cold exposure. Hum. Biol., 1967, 39, 155-169.

Bartleson, C. J. Memory colors of familiar objects. J. opt. Soc. Amer., 1960, 50, 63-77.

Bartley, S. H. Principles of Perception. New York: Harper and Bros., 1958.

Berkowitz, L. Anti-Semitism and the displacement of aggression. J. Ab. Soc. Psychol., 1959, 59, 182-187.

Berkowitz, L. Some factors affecting the reduction of overt hostility. J. Ab. Soc. Psychol., 1960, 60, 14-21.

Berkowitz, L. Anti-Semitism, judgmental processes, and displacement of hostility. J. Ab. Soc. Psychol., 1961, 62, 210-215.

Berkowitz, L. Advances in experimental social psychology. Academic Press, New York: 1965.

Bernbach, H. A. The effect of Labels on short-term memory for colors with nursery school children, Psychon. Sci., 1967, 7, 149-150.

Bixby, F. A phenomenological study of lustre. J. gen. Psychol., 1928, 1, 136-174.

Brody, N. and Oppenheim, P. Tensions in Psychology between the methods of behaviorism and Phenomenology, Psychol. Rev., 1966, 73 (4), 295-305.

Bruner, J. S. Personality dynamics and the process of perceiving. In R. R. Blake and G. V. Ramsey (Eds.) Perception: an approach to personality, New York: Ronald Press, 1951.

Bruner, J. S., and Goodman, C. C. Value and need as organizing factors in perception. in Levitas, G. B. (ed.) The World of Psychology, Vol. I, George Braziller, New York, 1963.

Bruner, J. S. and Postman, L. Symbolic value as an organizing factor in perception. J. Soc. Psychol., 1948, 27, 203-208.

Bruner, J. S., Postman, L. and Rodrigues, J. Expectation and the perception of color. Amer. J. Psychol., 1951, 64, 216-227.

Brunsting, L. A. and Sheard, C. The color of the skin as analyzed by spectrophotometric methods. J. clin. Invest., 1929, 7, 593.

Burke, W. W. Social perception as a function of dogmatism. Percept. Mot. Skills, 1966, 23 (3), 863-868.

Burnham, R. W. and Clark, Joyce R. A test of hue memory. J. appl. Psychol. 1955, 39, 164-172.

Caldwell, W. E., and Mattoon, C. U. The Somato-Chroma Apperception Test: A quantitative projective technique. J. gen. Psychol., 1966, 74 (2), 253-272.

Carter, L. F., and Schooler, K. Value, need and other factors in perception. Psychol. Rev., 1949, 56, 200-207.

Chapanis, A. Color names for color space. American Scientist, 1965, 53, 327-346.

Chein, I., Lane, R., Murphy, G., Proshansky, H. and Schafer, R. Need as a determinant of perception: a reply to Postore, J. Psychol., 1951, 31, 129-136.

Clark, K. B. and Clark, M. K. The development of consciousness of self and the emergence of social identification in Negro preschool children. J. Soc. Psychol., 1939, 10, 591-599.

Clark, K. B., and Clark, M. K. Skin color as a factor in racial identification of Negro preschool children. J. Soc. Psychol., 1940, 11, 159-169.

Clark, K. B. and Clark, M. P. Emotional factors in racial identification and preference in Negro children. J. Negro. Educ., 1950, 19, 341-350.

Coon, C. S. with E. E. Hunt. The Living Races of Man. New York: Knopf, 1965.

Crockett, J. H. and Meidinger, T. Authoritarianism and interpersonal perception. J. Ab. Soc. Psychol., 1956, 53, 378-380.

Dobzhansky, T. Mankind Evolving: The Evolution of the Human Species. New Haven and London: Yale University Press, 1962.

Dukes, W. F., and Bevan, W. Jr. Accentuation and response variability in the perception of personally relevant objects. J. Pers., 1952, 20, 457-465.

Edwards, A. L. Experimental Design in Psychological Research. New York: Holt, Rhinehart and Winston, 1962.

Edwards, E. A. and Duntley, S. Q., The pigments and color of living human skin. Am. J. Anat., 1939a, 65, 1-33.

Edwards, E. A. and Duntley, S. Q., An analysis of pigment changes after exposure to sunlight. Science, 1939b, 90, 235-237.

Farnsworth, D. The Farnsworth-Munsell 100-hue and dichotomous tests for color vision. J. opt. Soc. Amer., 1943, 33, 568-578.

Fisher, D. G. and Rule, Brendan. Anti-Semitism, stress, and anchor effects on interpersonal judgments. J. pers. soc. Psychol., 1967, 6, 447-450.

Fulk, B. E. and Harrell, T. W. Negro-white Army Test scores and last school grade. J. appl. Psychol, 1952, 36, 34-35.

Garrett, H. E. The Equalitarian Dogma. Perspect. Biol. Med., 1961, 4, 480-484.

Gilchrist, J. C., and Nesberg, L. S. Need and perceptual change in need-related objects. J. exp. Psychol., 1952, 44, 369-376.

Gitelson, S. Determination of skin color with the use of perforated Munsell color standards: Visocolorimetry of the skin. Israel J. Med. Sci., 1965, 1, 994-1003.

Hamwi, V., and Landis, C. Memory of Color. J. Psychol., 1955, 39, 183-194.

Harbin, S. F. and Williams, J. E. Conditioning of color connotations. Perc. Mot. Skills, 1966, 22, 217-218.

Harrison, G. A. The measurement and inheritance of skin color in man. Eugen. Rev., 1957, 49, 73-76.

Harrison, G. A. The skin color of the Coingang and Guarani Indians of Brazil. Hum. Biol., 1966, 38, 104-111.

Harrison, G. A. and Owen, J. J. T. The application of spectro photometry to the study of skin color inheritance. Acta. Genet., 1956, 4, 480-485.

Harrison, G. A. and Owen, J. J. T. Studies on the inheritance of human skin color. Am. Hum. Genet., 1964, 28, 27-37.

Harrison, G. A., Owen, J.J.T., Da Rocha, F. J., and Salzano, F. M., Skin Color in southern Brazilian populations, Hum. Biol., 1967, 39 (1), 21-31.

Hastorf, A. H. and Knutson, A. L. Motivation, perception, and attitude change. Psychol. Rev., 1949, 56, 88-99.

Hollingworth, H. L. The central tendency of judgment. J. Phil. Psychol., 1910, 7, 461-469.

Horton, C. P. and Crump, E. P. Growth and development: II. Skin color in Negro infants and parents: Its relationship to borth weight, reflex maturity, socioeconomic status, length of gestation and parity. J. Pediat., 159, 53, 547-558.

Huizinga, J. Reflectometry of the skin in Dogons. Biol. Med., 1965, 68, 289-296.

Huxley, Sir Julian. Eugenics in evolutionary perspective. Perspect. Biol. Med., 1963, 6, 155-187.

Ingle, D. J. Editorial: The need to study biological differences among racial groups: moral issues. Perspect. Biol. Med., 1967, 10, 497-499.

Journal of the Optical Society of America, 1943, 33 (7), 355-422.

Judd, D. B. Basic correlates of the visual stimulus. in S. S. Stevens (ed.) Handbook of Experimental Psychology, New York: Wiley, 1951.

Katz, David. The world of color. London: Kegan Paul, 1935.

Kaufman, H. S. and Sulzberger, M. B. Infra red thermometry for reading reactions on darkly pigmented skin. JAMA, 1967, 202, 91-93.

Krech, D. and Crutchfield, R. S. Theories and problems of social psychology. New York: McGraw-Hill, 1948.

Lechelt, E. C. Effects of motivational factors on a child's discrimination of number. (Unpublished Master's thesis, U. of Alberta) 1966.

Leibowitz, H. W. Visual Perception. New York: Macmillan, 1965.

Leibowitz, H. and Heisel, M. L'evolution de l'illusion de Ponzo en fonction de l'age. Archives de Psychologie, 1958, 36, 328-331.

Lenneberg, E. Color naming, color recognition, color discrimination: a re-appraisal. Perceptual Motor Skills, 1961, 12, 375-382.

Levine, R., Chein, I., and Murphy, G. The relation of the intensity of a need to the amount of perceptual distortion: a preliminary report. J. Psychol., 1942, 13, 283-293.

Loiselle, R. H. and Williamson, Lynn T. Perceptual defense to racially significant stimuli. Percept. Mot. Skills, 1966, 23, 3(1), 730.

Luchins, A. S. On an approach to social perception. J. Pers., 1950, 19, 64-84.

Luchins, A. S. An evaluation of some current criticisms of Gestalt psychological work on perception. Psych. Rev., 1951, 58, 69-95.

Marfatia, J. C. Cultural and social factors contributing to child's maladjustment. Indian J. soc. W., 1958, 19, 115-118.

Marks, E. S. Skin color judgments of Negro college students. J. Ab. Soc. Psychol., 1943, 38, 370-378.

Mazess, R. B. Skin color in Bahamian Negroes. Hum. Biol., 1967, 39, 145-154.

Munsell, A. H. Munsell book of color. Munsell Color Company, Baltimore, 1929.

Murphy, G. Personality: a biosocial approach to origins and structure. New York: Harper, 1947.

Natapoff, A. The consideration of evolutionary conservatism toward a theory of the human brain. Perspectives in Biology and Medicine, 1967, 444-461.

Parrish, C. H. Color names and color notions. J. Negro. Educ., 1946, 15, 13-20.

Parsons, T. and Clark, K. B. The Negro American. Cambridge: Houghton Miflin, 1966.

Pastore, N. Need as a determinant of perception. J. Psychol., 1949, 28, 457-475.

Pepitone, Albert. Motivational effects in social perception. Human Relations, 1950, 3, 57-76.

Piaget, J. The child's conception of physical causality. New York: Harcourt, Brace and Co., 1930.

Plant, W. T., Telford, C. W., and Thomas, J. A. Some personality differences between dogmatic and non-dogmatic groups. J. Soc. Psychol., 1965, 67, 67-75.

Postman, J. S. One kind of perception: A reply to Professor Juchins. Psych. Rev., 1951, 58, 306-312.

Pratt, Carroll C. The role of past experience in visual perception. J. Psychol., 1950, 30, 85-107.

Rabinovitz, W. A note on the social perceptions of authoritarians and non-authoritarians. J. Ab. Soc. Psychol., 1956, 53, 384-386.

Richter, M. Internationale Bibliographie der Farbenlehre und ihrer Grenzgebiete. Nr. 1: Berichtszeit 1940 - 1949. Gottingen: "Musterschmidt" Wissen schaftlicher Verlag; 1952.

Richter, M. Internationale Bibliographie der Farbenlehre und ihrer Grenzgebiete. Nr. 2: Berichtszeit 1950-1954. Gottingen: "Musterschmidt-Verlag;" 1963.

Rokeach, M. The open and closed mind. 1960, New York: Basic Books.

Rule, Brendan. Anti-semitism, stress, and the perception of strangers. J. pers. soc. Psychol., 1966, 3, 132-134.

Sarbin, T. R. and Bailey, D. E. The immediacy postulate in the light of modern cognitive psychology. in The Psychology of Egon Brunswik, K. R. Hammond (ed.) New York: Holt, Rhinehart and Winston, 1966.

Scodel, A. and Freedman, M. L. Additional observations on the social perceptions of authoritarians and non-authoritarians. J. Ab. Soc. Psychol., 1956, 52, 92-95.

Seeman, M. A situational approach to intra-group Negro attitudes. Sociometry, 1946, 9, 199-206.

Seigel, S. Nonparametric Statistics: For the Behavioral Sciences. New York: McGraw-Hill, 1965.

Shaxby, J. H. and Bonnell, H. E. On skin color. Man, 1928, 60-64.

Shuey, Audrey M. The Testing of Negro Intelligence (2nd ed.) New York: Social Science Press, 1966.

Stevens, S. S. (ed.) Handbook of Experimental Psychology. New York: Wiley, 1951.

Stevens, S. S. and Greenbaum, Hilda B. Regression effect in psychophysical judgment. Perception and Psychophysics. 1966, 1, 429-446.

Sunderland, E. The skin color of the people of Azraq, Eastern Jordan. Hum. Biol., 1968, 39 (1), 65-70.

Tajfel, H. The anchoring effects of value in a scale of judgments. Brit. J. Psychol., 1959, 50, 294-304.

Wallach, H. The perception of neutral colors. Scientific American, 1963, 208, 107-114.

Wasserman, H. P. Human pigmentation and environmental adaptation. Arch. Environ. Health, 1965, 11, 691-694.

Weiner, J. S. A spectro photometer for measurement of skin color. Man, 1951, 51, 152-153.

Weiner, J. S., Harrison, G. A., Singer, R., Harris, R., and Jopp, W. Skin color in Southern Africa. Hum. Biol., 1964, 36, 294-307.

Weiner, J. S., Sebag-Montefiere, N. C., and Peterson, J. N. A note on the skin color of Aguarana Indians of Peru. Hum. Biol., 1964, 35, 470-473.

Williams, J. E. Connotations of color names among Negros and Caucasians. Percept., Mot. Skills, 1964, 18, 721-731.

Williams, J. E. Connotations of racial concepts and color names. J. pers. soc. Psychol., 1966, 3, 531-540.

Williams, J. E. and Carter, Dorothy Jean. Connotations of racial concepts and color names in Germany. J. Soc. Psychol., 1967, 72, 19-26.

Woodworth, R. S. and Schlosberg, H. Experimental Psychology, New York: Holt, Rhinehart and Winston, 1954.

## APPENDIX 1a

Sample data sheet for a subject making lightness judgments under the Negroid context. Cells marked with D indicate a delayed match.

| Munsell value of stimulus | Picture 1 | | Picture 2 | | Picture 3 | | Picture 4 | |
|---|---|---|---|---|---|---|---|---|
| 3 | 1.5 | $1.5_D$ | $3.5_D$ | 1.5 | 2.0 | $2.0_D$ | $3.0_D$ | 2.0 |
| 4 | $1.5_D$ | 3.0 | 4.0 | $2.0_D$ | $4.0_D$ | 4.0 | 3.5 | $2.0_D$ |
| 5 | 2.5 | $3.0_D$ | $6.0_D$ | 6.5 | 5.0 | $2.5_D$ | $3.5_D$ | 5.0 |
| 6 | $6.0_D$ | 5.5 | 6.5 | $5.0_D$ | $6.5_D$ | 5.5 | 6.0 | $4.5_D$ |
| 7 | 7.5 | $3.5_D$ | $5.0_D$ | 6.5 | 7.0 | $5.5_D$ | $4.5_D$ | 6.5 |
| 8 | $7.5_D$ | 7.5 | 8.0 | $6.0_D$ | $7.0_D$ | 8.0 | 7.5 | $5.0_D$ |
| 9 | 8.5 | $6.0_D$ | $7.0_D$ | 8.5 | 7.5 | $5.0_D$ | $8.5_D$ | 8.5 |

## APPENDIX 1b

Sample averaged data sheet for subject making lightness judgments under Negro context. Responses to the four pictures were grouped together for statistical purposes.

| | Munsell value of stimulus | | | | | | |
|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Immediate matches | 1.75 | 3.63 | 4.75 | 5.88 | 6.88 | 7.75 | 8.25 |
| Delayed matches | 2.50 | 2.38 | 3.75 | 5.50 | 4.63 | 6.38 | 6.63 |

# APPENDIX 2

Intercorrelations among lightness judgments, hue-memory, and authoritarianism for 60 subjects, averaged over all contexts.

| | C3 | D3 | C4 | D4 | C5 | D5 | C6 | D6 | C7 | D7 | C8 | D8 | C9 | D9 | F | HM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C3 | | 85 | 82 | 83 | 78 | 72 | 72 | 67 | 62 | 61 | 51 | 43 | 42 | 39 | -30 | -09 |
| D3 | | | 85 | 87 | 79 | 72 | 73 | 65 | 57 | 53 | 44 | 39 | 44 | 34 | -26 | 03 |
| C4 | | | | 86 | 84 | 78 | 80 | 72 | 64 | 54 | 52 | 44 | 40 | 32 | -25 | 01 |
| D4 | | | | | 85 | 83 | 79 | 73 | 64 | 63 | 49 | 47 | 41 | 35 | -23 | 00 |
| C5 | | | | | | 78 | 87 | 77 | 72 | 72 | 62 | 53 | 57 | 41 | -16 | 02 |
| D5 | | | | | | | 77 | 72 | 71 | 71 | 52 | 49 | 44 | 38 | -31 | 01 |
| C6 | | | | | | | | 82 | 82 | 74 | 69 | 61 | 63 | 48 | -24 | 06 |
| D6 | | | | | | | | | 78 | 72 | 64 | 57 | 52 | 43 | -30 | 16 |
| C7 | | | | | | | | | | 82 | 79 | 66 | 74 | 61 | -15 | 08 |
| D7 | | | | | | | | | | | 75 | 72 | 74 | 69 | -09 | 08 |
| C8 | | | | | | | | | | | | 82 | 85 | 77 | -20 | 03 |
| D8 | | | | | | | | | | | | | 77 | 79 | -10 | 08 |
| C9 | | | | | | | | | | | | | | 84 | -05 | 08 |
| D9 | | | | | | | | | | | | | | | -05 | -10 |
| F | | | | | | | | | | | | | | | | -16 |
| HM | | | | | | | | | | | | | | | | |

C = contiguous match

D = delayed match

3, 4, . . . 9 = Munsell value

F = F-score (authoritarianism)

HM = Hue-memory score.